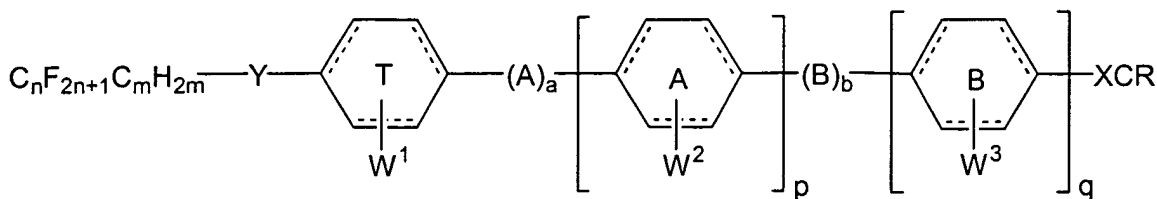


CLAIMS

We claim:

1. A chiral, non-racemic liquid crystal composition which comprises an achiral liquid crystal host and up to about 100% by weight of one or more chiral, non-racemic compounds having the formula:



wherein n and m are integers ranging from 1 to about 20;

a, b, p and q are either 0 or 1, when p is 0, a is 0 and when q is 0, b is 0;

Y is a single bond or an oxygen;

X is selected from the group consisting of a single bond, oxygen, -CO-, -O-CO-, and -CO-O-;

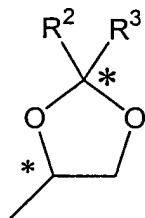
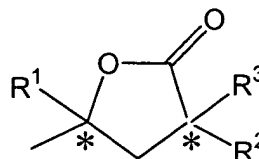
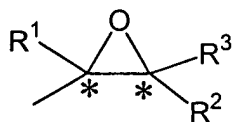
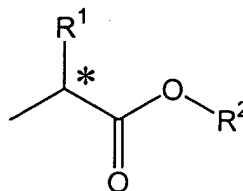
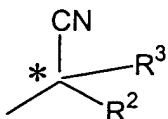
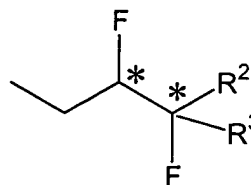
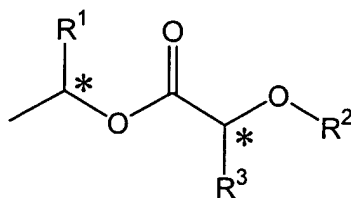
CR is a chiral, non-racemic tail group except that CR cannot be a chiral hydrocarbon tail;

A and B, independently, are linker groups that can be selected from the group consisting of -CO-, -O-CO-, -CO-O-, -CH₂-CH₂-, -CH₂-CH₂-O-, -O-CH₂-CH₂-, -C≡C-, -C=C-, and -C=C-C=C-;

W¹, W², and W³, independently, represent one or more optional substituents on core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, nitro and nitrile; and

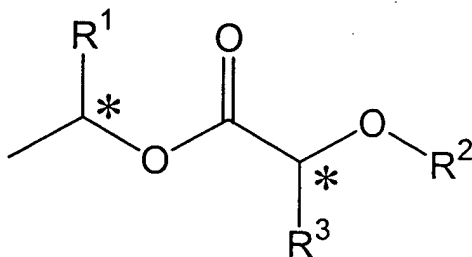
rings T, A and B together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH₂ groups or CH groups are replaced by -N-, NH-, -O- or -CO-.

2. The composition of claim 1 wherein CR is selected from the group consisting of :

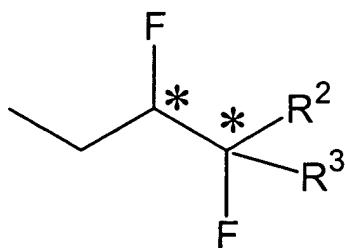


wherein * indicates an asymmetric carbon; R^1 and R^3 , independently of each other, are lower alkyl or alkenyl groups optionally substituted with one or more halogens, and R^2 is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH_2 groups are replaced with $-S-$, $-O-$, $-CO-$, $-CO-O-$, $-O-CO-$, or $-Si(R')_2$, and where R' is a lower alkyl optionally substituted with one or more halogens.

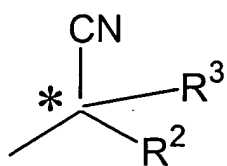
3. The composition of claim 1 wherein CR is:



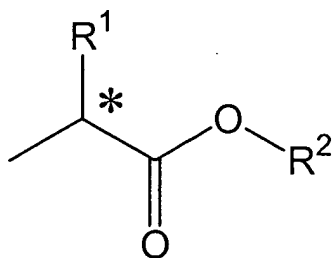
4. The composition of claim 1 wherein CR is:



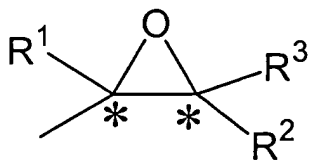
5. The composition of claim 1 wherein CR is:



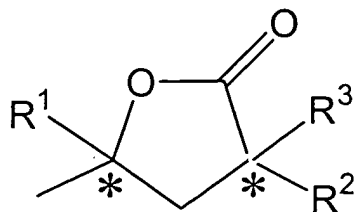
6. The composition of claim 1 wherein CR is:



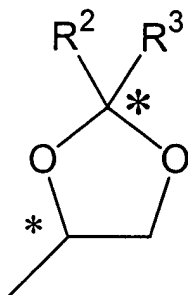
7. The composition of claim 1 wherein CR is:



8. The composition of claim 1 wherein CR is:

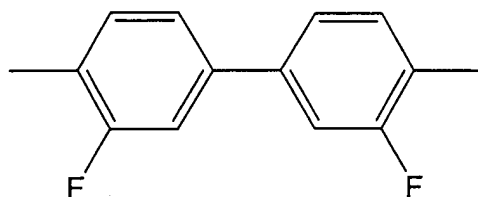


9. The composition of claim 1 wherein CR is:

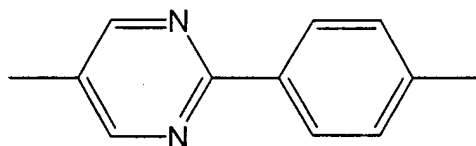


10. The composition of claim 1 wherein the chiral nonracemic compound has a biphenyl mesogenic core.

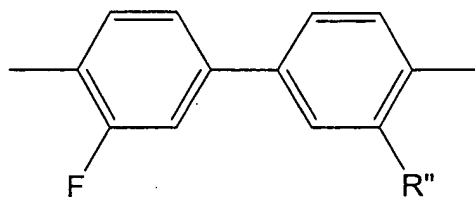
11. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



12. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



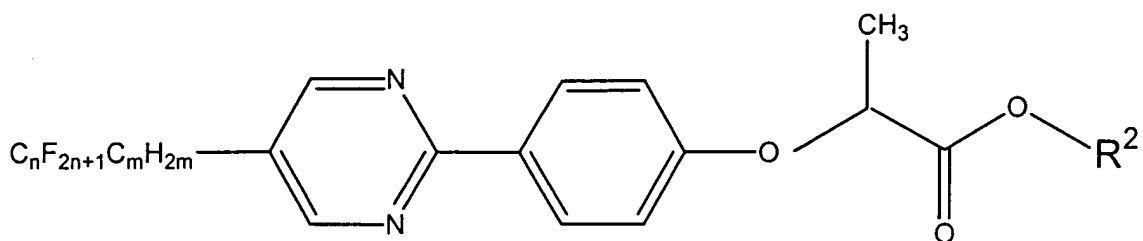
13. The composition of claim 1 wherein the chiral nonracemic compound has the mesogenic core:



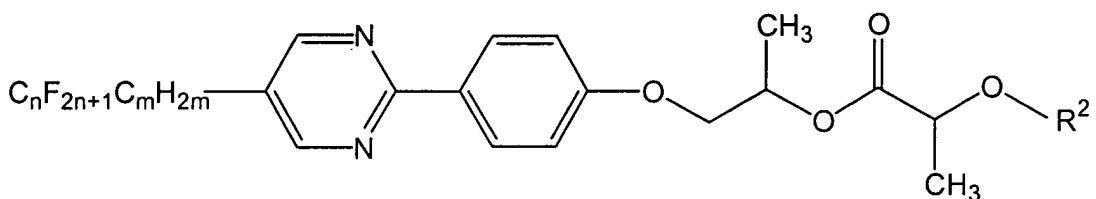
where R'' is a lower alkyl group.

14
15. The composition of claim 1 wherein the host is MX6111.

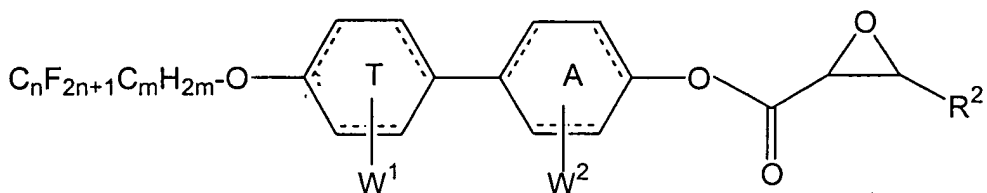
15
16. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



16
17. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



17
18. The composition of claim 1 wherein the chiral nonracemic compound has the formula:



18
19. The composition of claim 18 wherein in the chiral nonracemic compound both of rings T and A are phenyl rings in which one or two of the CH groups can be replaced with a N and wherein W^1 is selected from the group of halogens, alkyl groups or haloalkyl groups.

19
20. The composition of claim 1 wherein in the chiral nonracemic compound $n = m$.

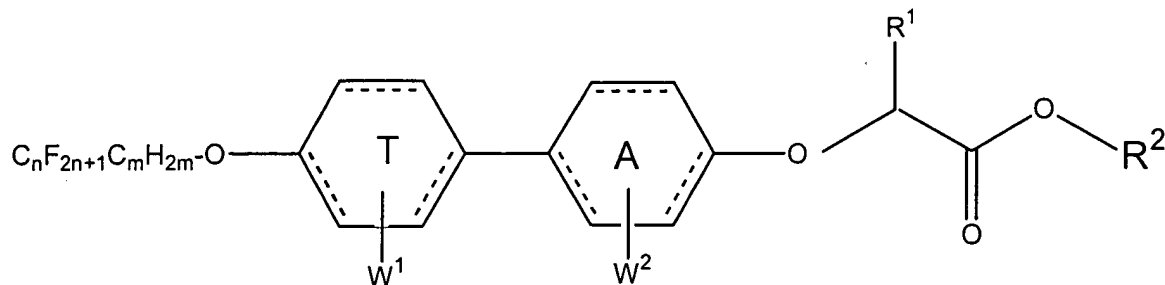
20
21. The composition of claim 1 wherein in the chiral nonracemic compound Y is O.

21
22. The composition of claim 1 wherein the chiral nonracemic compounds are present in the composition at a level of 10% or less.

22
23. The composition of claim 1 which has Ps of 10 nC/cm² or more at room temperature.

23
24. The composition of claim 23 wherein the chiral nonracemic compounds are present at a level of 5% by weight or less.

24
25. A chiral nonracemic compound having the formula:

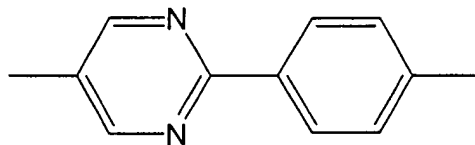


where n and m are integers ranging from 1 to about 15, W^1 and W^2 , independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH_2 groups or CH groups are replaced by -N-, NH-, -O- or -CO-; R^1 is a lower alkyl or alkenyl group optionally substituted with one or more halogens and R^2 is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH_2 groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

25
26. The compound of claim 25 wherein $n = m$.

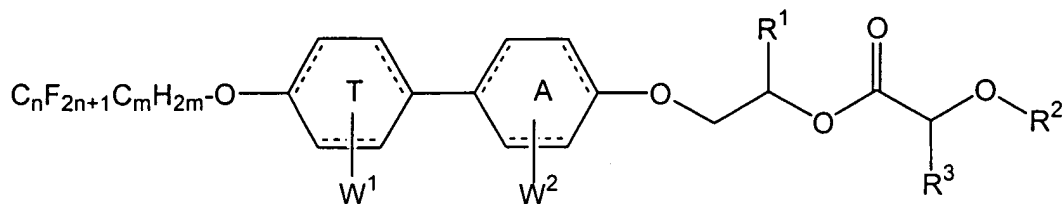
26
27. The compound of claim 25 wherein R^1 is a methyl group.

27
28. The compound of claim 25 wherein the mesogenic core is:



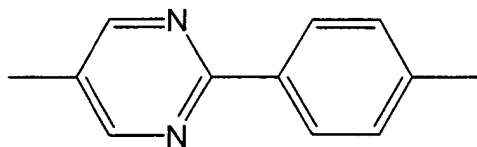
28
29. The compound of claim 25 wherein the mesogenic core is biphenyl.

29
30. A chiral nonracemic compound having the formula:

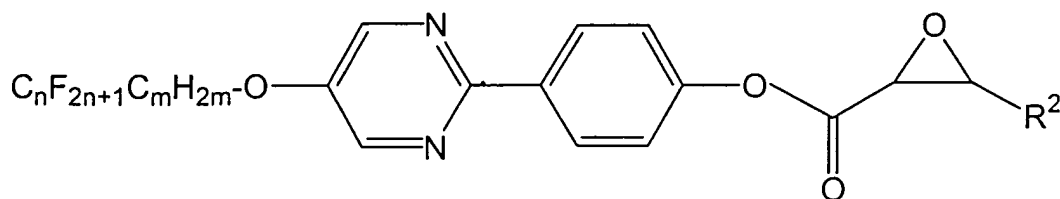


where n and m are integers ranging from 1 to about 15, W^1 and W^2 , independently, represent one or more optional substituents on mesogenic core rings which can be selected from the group consisting of H, halide, alkyl, haloalkyl, alkenyl, haloalkenyl, and nitrile; rings T and A together representing the mesogenic core are selected from the group cyclohexane, cyclohexene, a phenyl and a naphthyl group wherein one or two ring CH_2 groups or CH groups are replaced by -N-, NH, -O- or -CO-; R^1 and R^3 are lower alkyl or alkenyl groups that are optionally substituted with one or more halogens and R^2 is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH_2 groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

- 31.³² The compound of claim 30 wherein $n = m$.
- 32.³¹ The compound of claim 30 wherein R^1 and R^3 are both methyl groups.
- 33.³² The chiral nonracemic compound of claim 30 wherein the mesogenic core is biphenyl.
- 34.³³ The chiral nonracemic compound of claim 33 wherein the mesogenic core is:



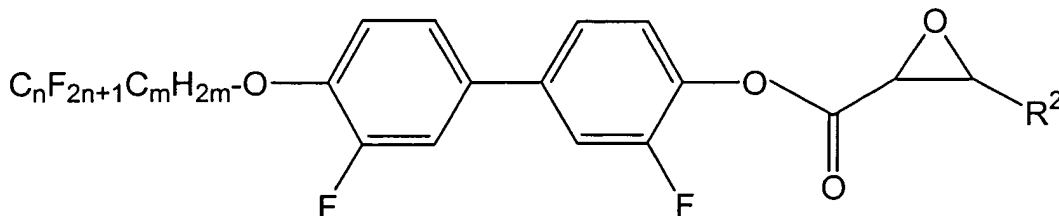
- 35.³⁴ A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and R² is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH₂ groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

37. The compound of claim 36 wherein n = m.

38. A chiral nonracemic compound having the formula:



where n and m are integers ranging from 1 to about 15 and R² is an alkyl, alkenyl, ether, thioether, or silyl group having from 1 to about 20 carbon atoms wherein one or more CH₂ groups are replaced with -S-, -O-, -CO-, -CO-O-, -O-CO-, or -Si(R')₂, and where R' is a lower alkyl optionally substituted with one or more halogens.

39. The compound of claim 38 wherein n = m.

40. An optical device comprising one or more compounds of claim 1.